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(54) **BATTERY PACK AND ELECTRIC BIKE
HAVING THE SAME**

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(21) Appl. No.: **13/544,793**

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KR	10-0590018	B1	6/2006

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(57) **ABSTRACT**

Provided is an food packing material, manufacturing method. A battery pack and a electrical bike having the same are further provided. In particular, the battery pack may include a battery pack, battery array, a protecting circuit module, and a connection terminal section. The battery case may be formed as cylindrical or polygon. The battery array may include a plurality of batteries formed as multi-stage within the battery pack. The protecting circuit module may be provided between an upper portion of the battery array and an upper surface of the battery pack. A connection terminal portion may be formed at the lower stage of the battery pack and may include a power terminal and a control terminal. By providing the battery pack as bottle shape, the electrical bike can selectively accommodate the bottle for the bike and the battery pack.

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B62K 19/40	(2006.01)
H01M 10/42	(2006.01)

(52) **U.S. Cl.**

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(2013.01); **B62M 6/90** (2013.01); **H01M**
2/1083 (2013.01); **H01M 10/425** (2013.01)

(58) **Field of Classification Search**

CPC H01M 2/02; H01M 14/00; H01M 2/00;
H02J 7/007; B60R 16/04
USPC 320/107, 112; 429/7, 98, 123, 163, 178;
180/206.4, 220

See application file for complete search history.

7 Claims, 11 Drawing Sheets

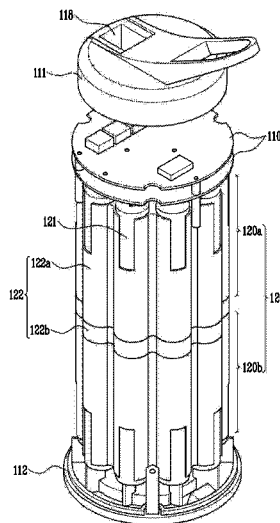


FIG. 1

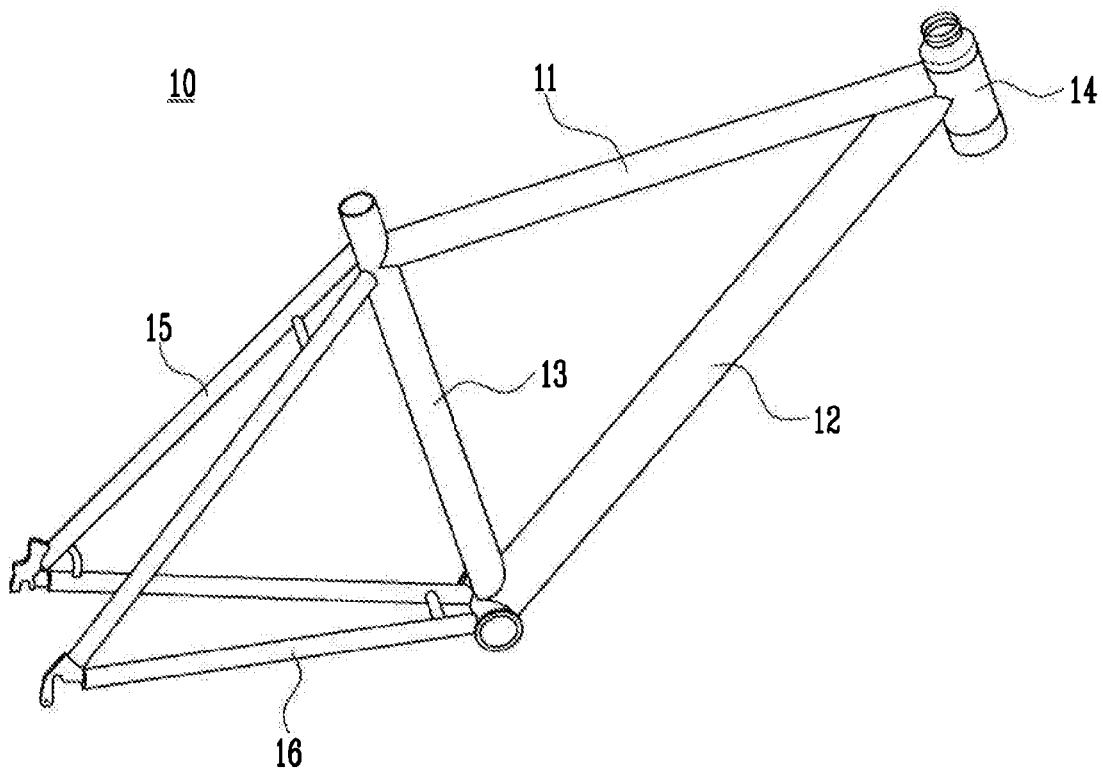


FIG. 2

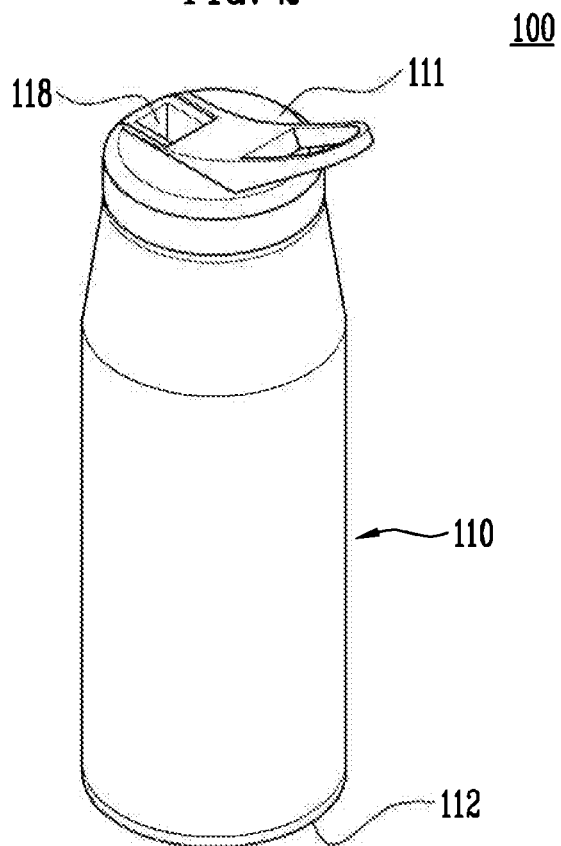


FIG. 3

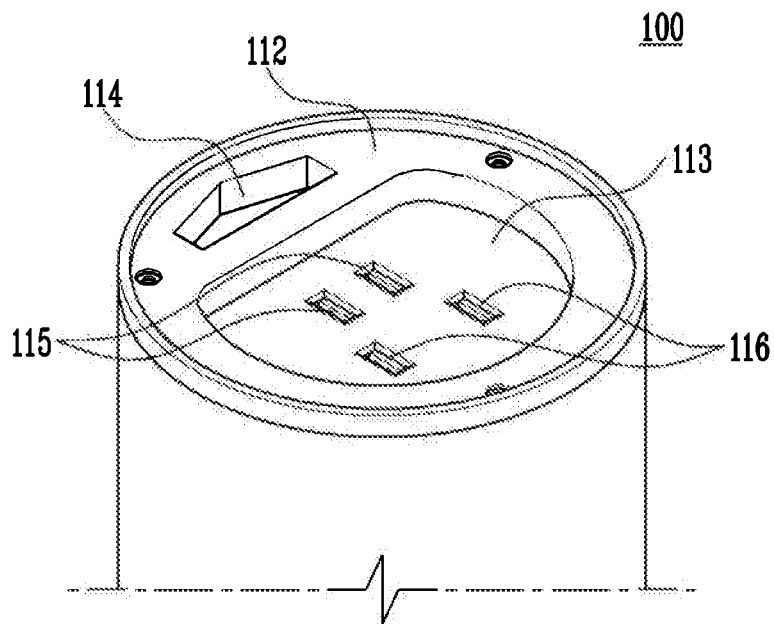


FIG. 4

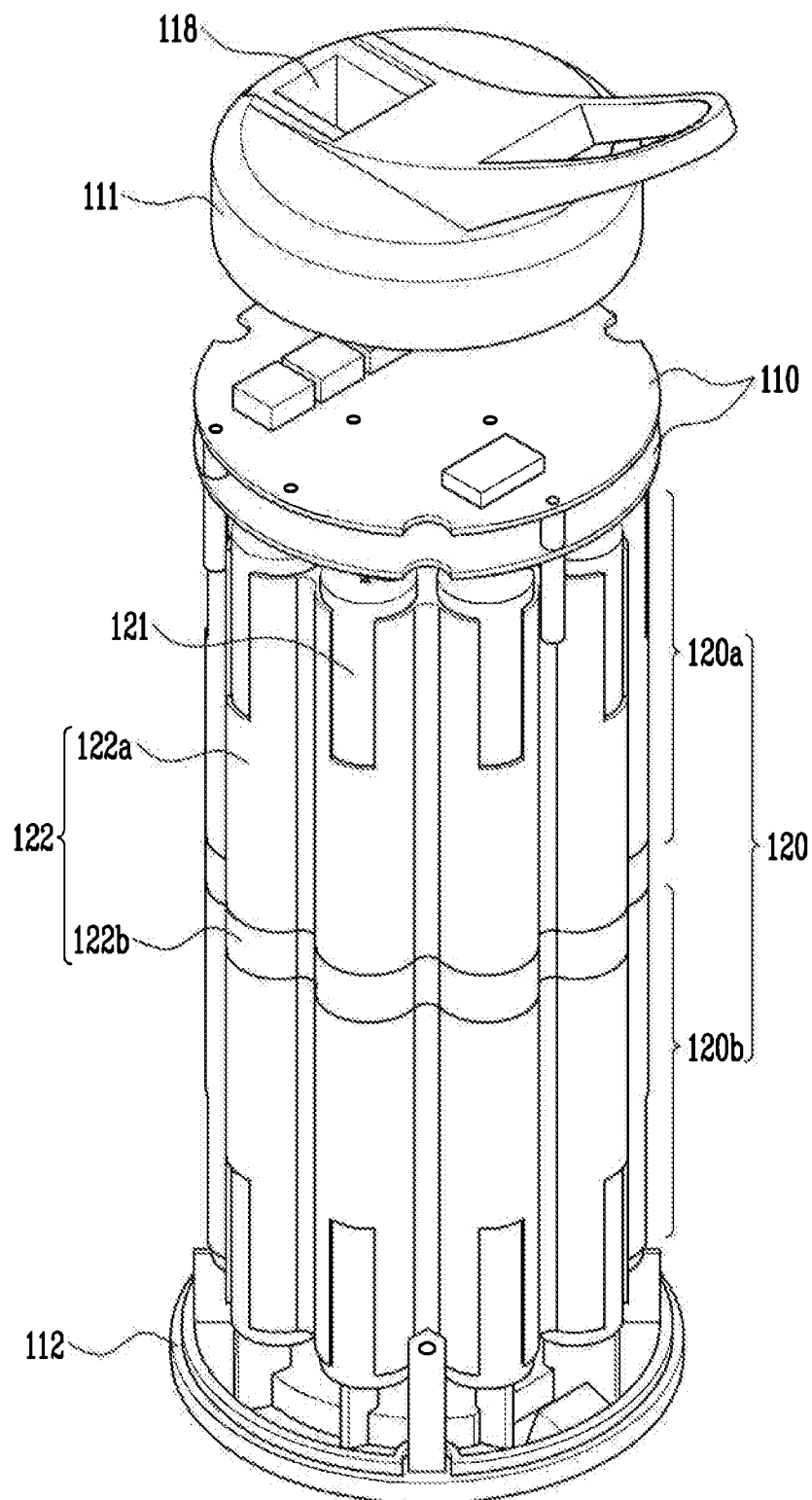


FIG. 5

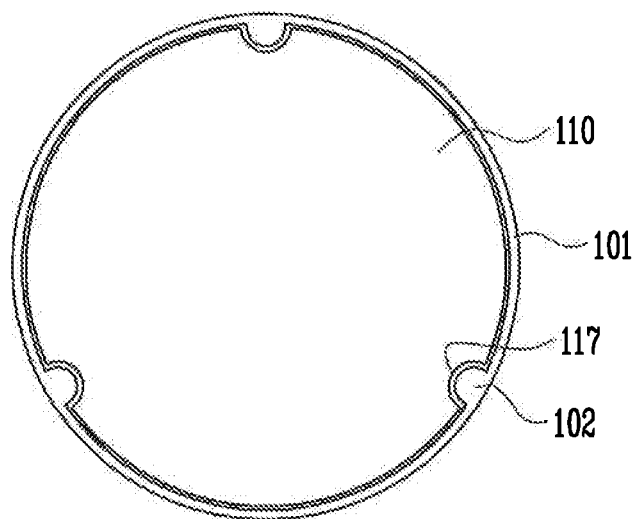


FIG. 6

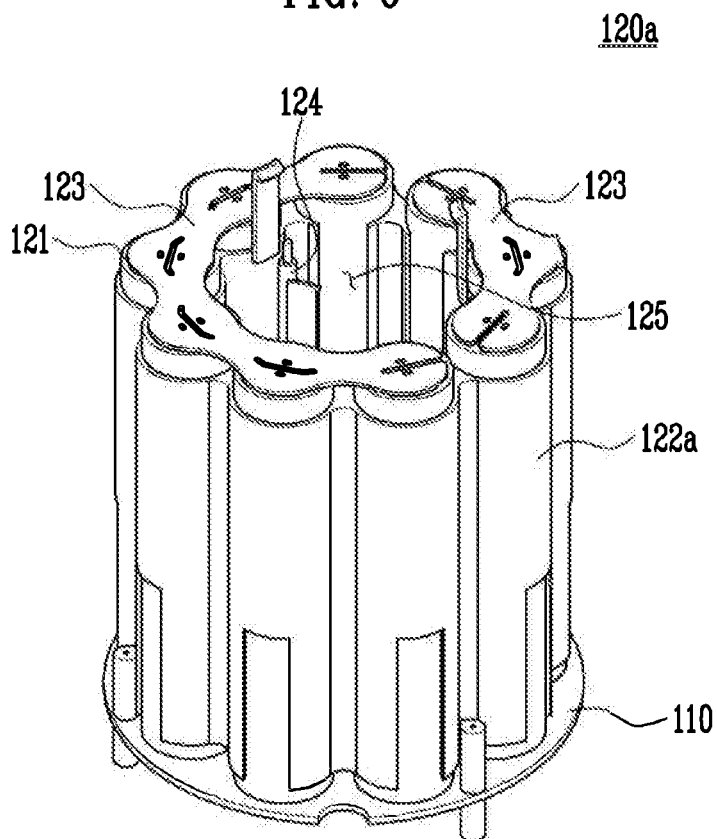


FIG. 7

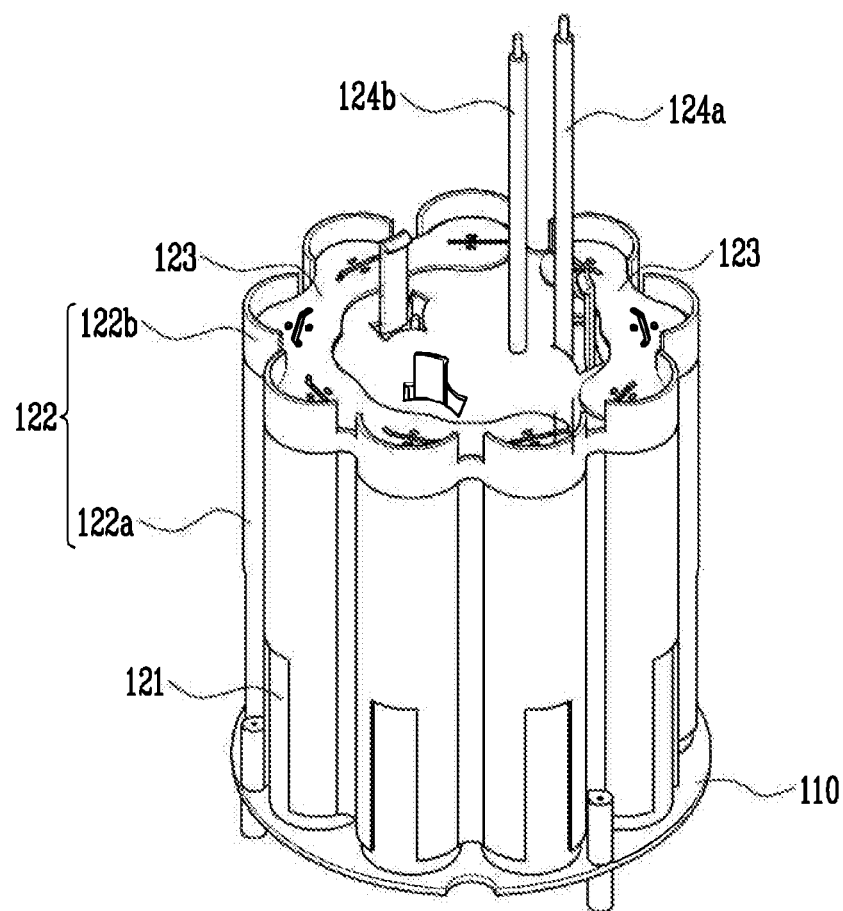


FIG. 8

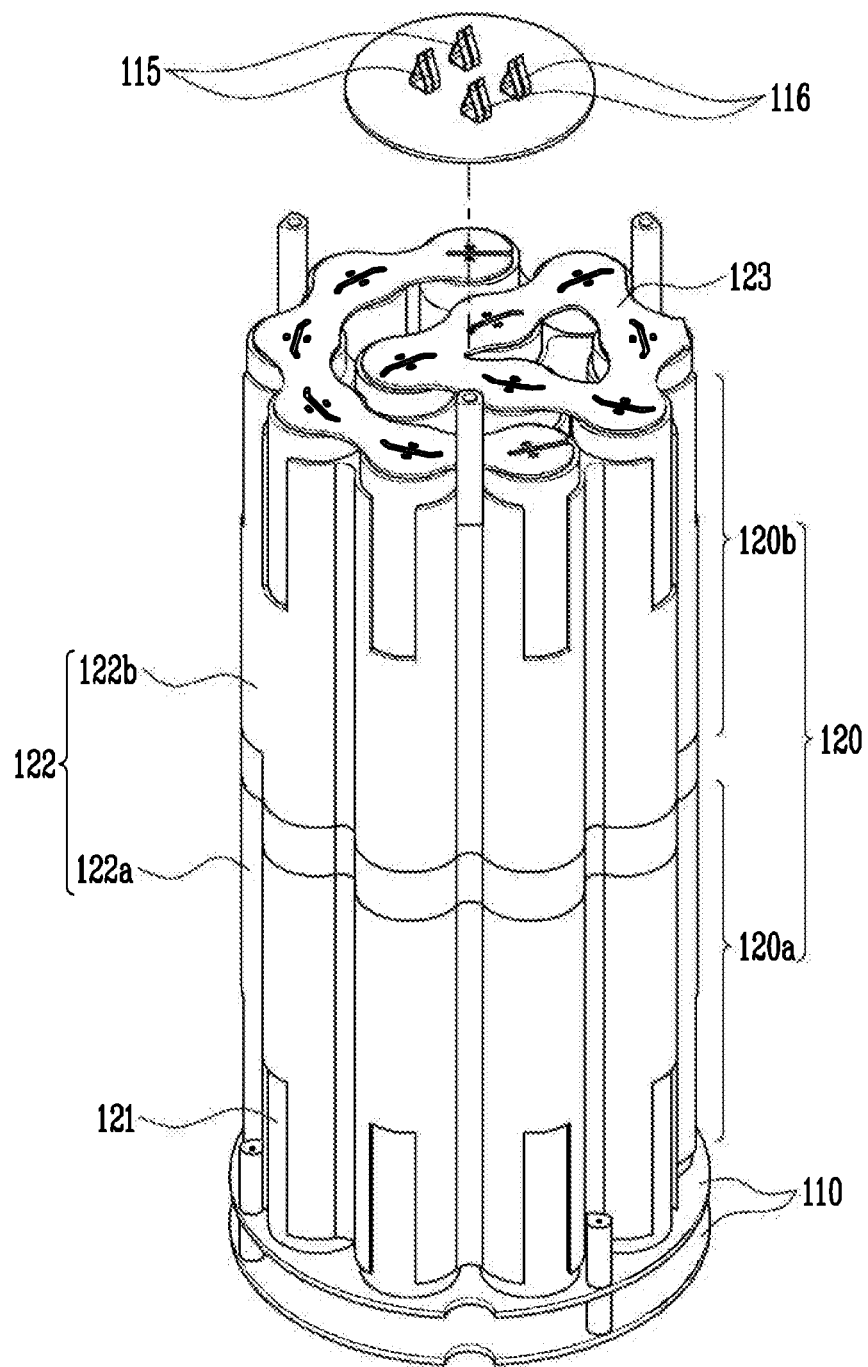


FIG. 9

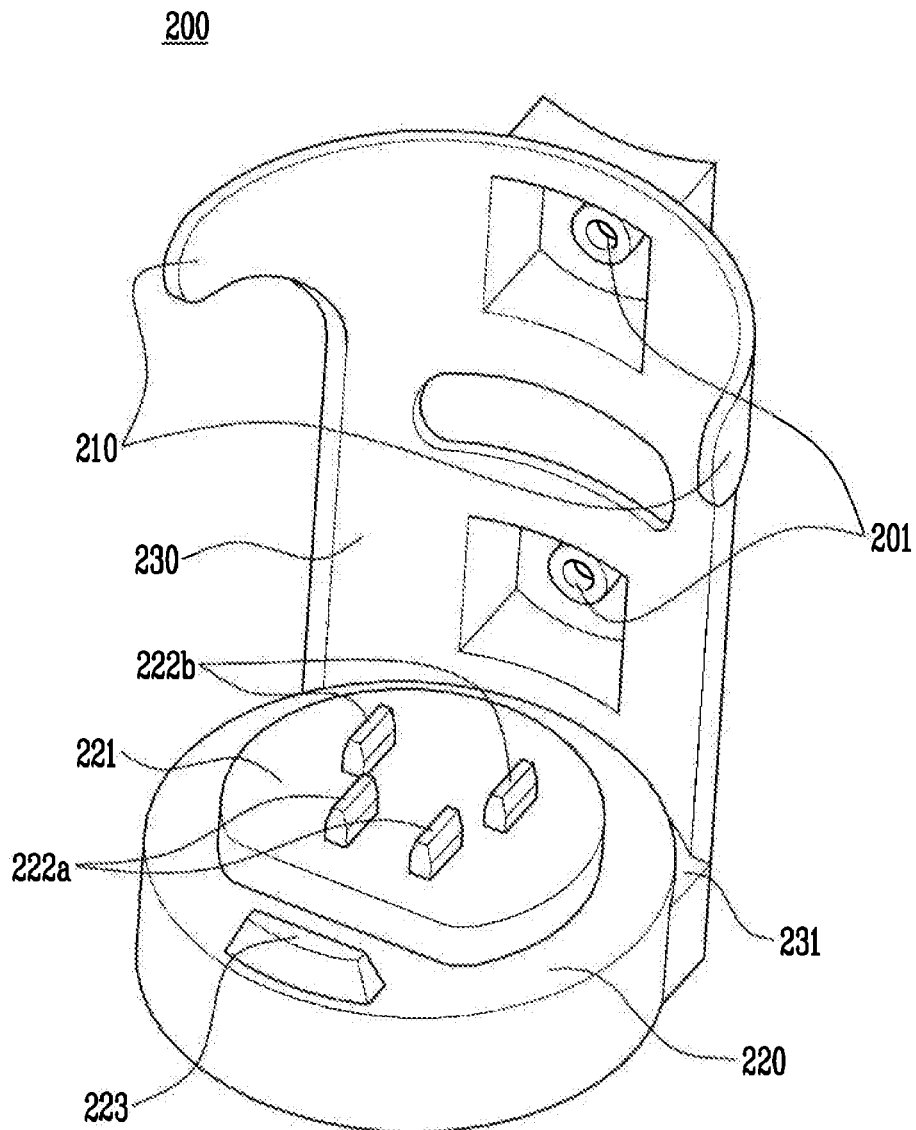


FIG. 10

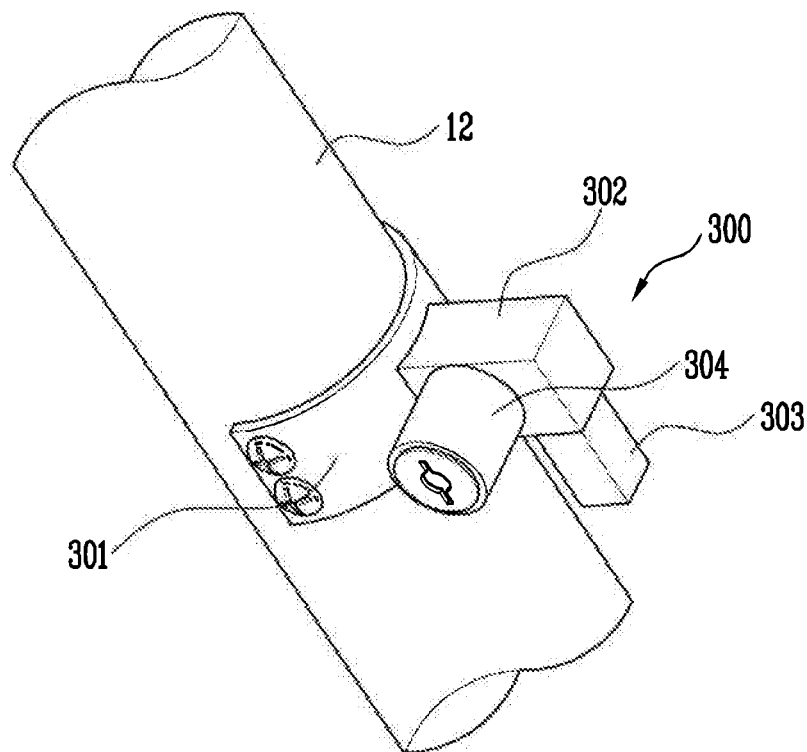


FIG. 11

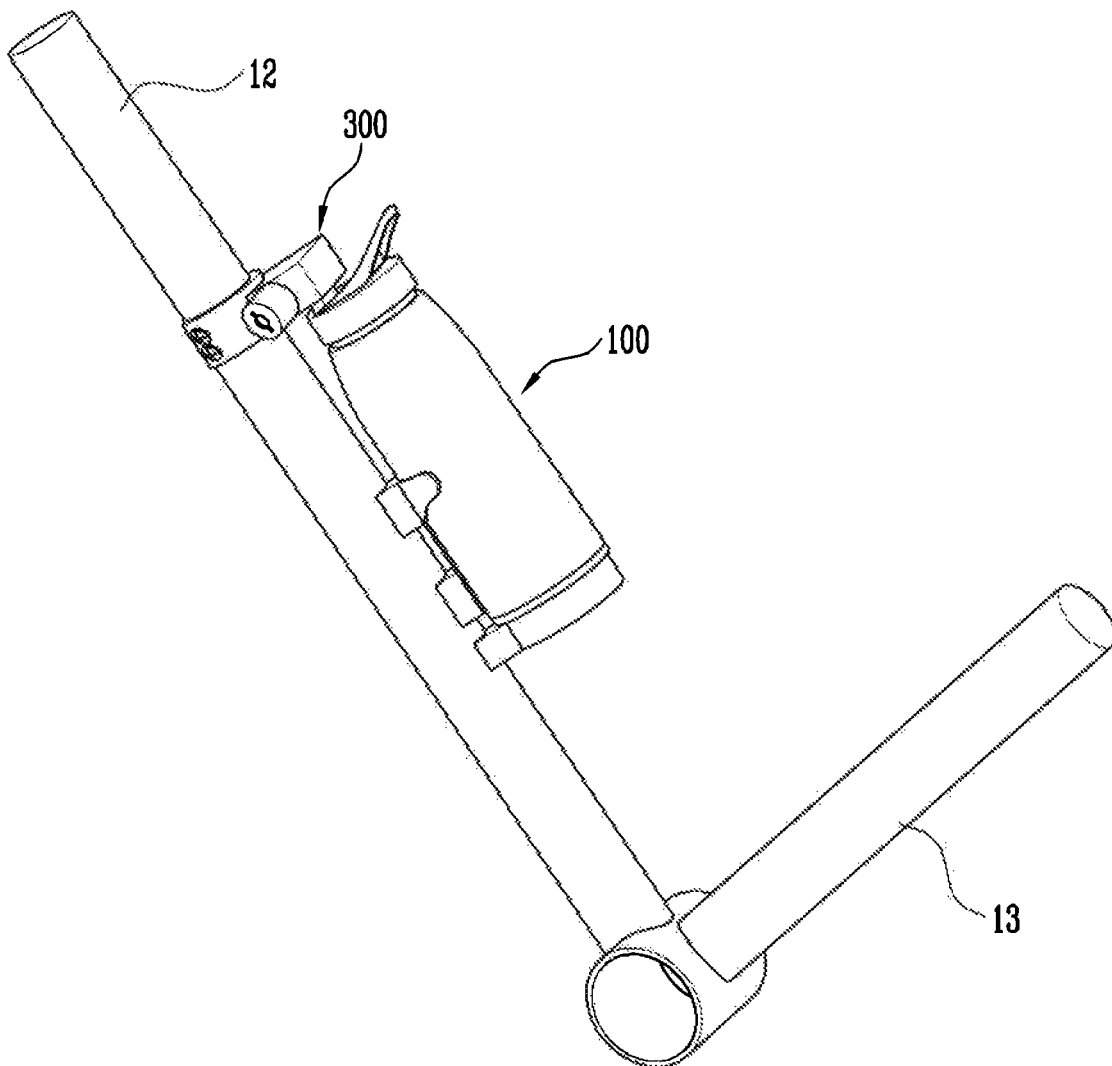


FIG. 12

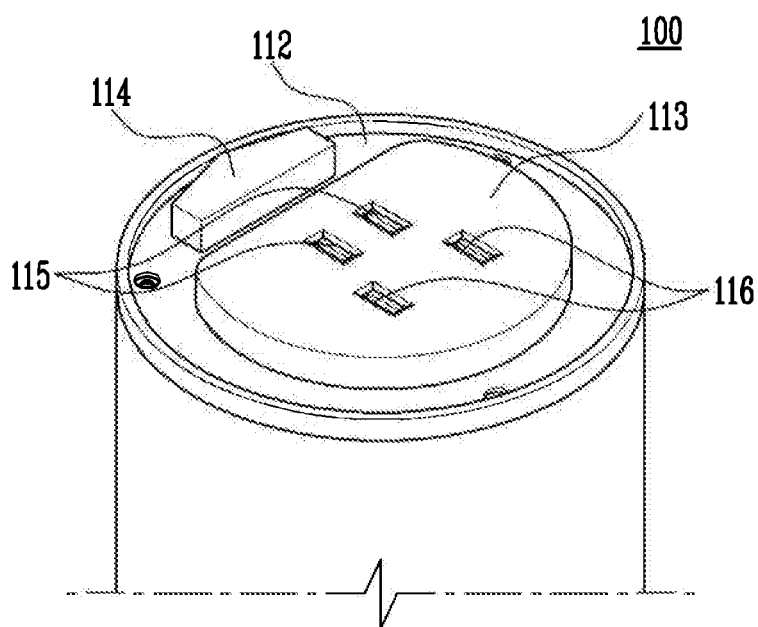
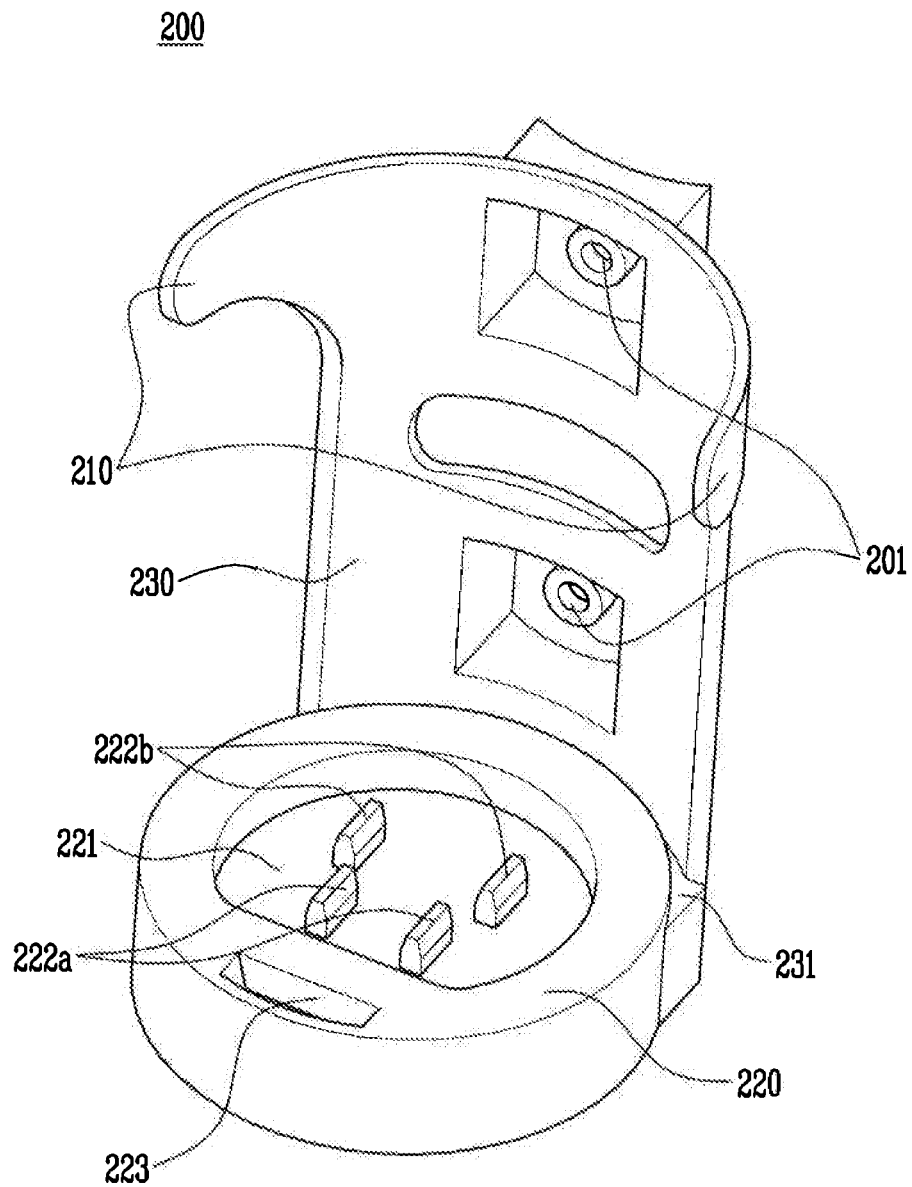


FIG. 13



BATTERY PACK AND ELECTRIC BIKE HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority of Korean Patent Application No. 10-2011-0118262, entitled "BATTERY PACK AND ELECTRIC BIKE HAVING THE SAME", and filed on Nov. 14, 2011, the entirety of which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Embodiments of the present disclosure relate to a battery pack and a electric bike having the same and, more particularly, to a battery pack having bottle shape and the electric bike having the same.

2. Description of the Related Art

Recently, interest in alternative energy has increased and, thus, a method for applying a secondary battery to an electric driving device, such as a electric bike or an electric car and the like, has been developed. The bike may include a frame equipped rotateably with two wheels and a tire attached to the wheels. In addition, a paddle for driving the wheels may be installed to one side of the frame and therefore a driving force generated by driving the paddle is transferred to the wheels through a chain.

For this reason, when a person moves a long distance or climbs a hill while riding a bike, he/she consumes much energy. For this, electrical bikes have been developed as alternatives to bikes in which she/he pedals to spin a wheel using a manpower. The electrical bike replaces this manpower by driving a motor using a secondary battery which may be charged between use and discharged during use.

SUMMARY OF THE INVENTION

An object of embodiments of the present disclosure is to provide a battery pack formed in shape of a bottle for a bike.

In addition, an object of embodiments of the present disclosure is to provide an electrical bike capable of selectively accommodating the bottle and the battery pack for the bike.

Further, an object of embodiments of the present disclosure is to provide a battery pack and an electrical bike having a structure protecting an electrical connecting section from outside moisture.

An object of embodiments of the present disclosure is to provide to a battery and an electrical bike for maintaining a stable structure in despite of external impact caused while operating an electrical operation.

In a battery pack providing power to an electrical bike, the battery pack in accordance to an embodiment of the present disclosure may include a battery array, a protecting circuit module and a connection terminal.

In the battery array, a plurality of batteries are placed within the battery pack having at least two more than stages and the batteries may be disposed so that a least one stage of the plurality of stages forms a space.

The protecting circuit module may be provided between the upper portion of the battery array and the upper surface of the battery pack.

The connection terminal section may be provided in a lower stage of the battery pack and includes a power terminal and a control terminal.

In addition, the power terminal may be connected to the protecting circuit module by the power line to input/output a charging/discharging current. In this case, the control terminal may be connected to the protecting circuit module by a control line to input a control signal from the outside.

Moreover, the protecting circuit module may include a incision portion at an outer side thereof and the battery pack has an third fixed protrusion portion corresponding to the protrusion portion in inner side to restrict the movement of the protecting circuit module when the protecting circuit module is inserted.

In addition, the battery array may be formed in an upper and lower two stages, any one stage of the battery array of the upper and lower two stages includes twelve batteries and the remaining one stage may includes nine batteries.

Moreover, the battery array may be connected in seven serials and three parallel manners.

Further, the battery array may include an output end thereof connected to the protecting circuit module.

In addition, a spacer may be provided that forms an inserting position of each battery including the battery array.

Moreover, the control terminal and the power terminal may be formed in inserting manners. In addition, the control terminal and the power terminal may be formed in a female connector shape.

In addition, the protecting circuit module may be formed as a substrates having at least two or more multi-stage.

On the other hand, the electrical bike in accordance with embodiments of the present disclosure may include a battery pack, a bottle cage, and a bike frame.

The battery pack formed as a cylindrical shape or a polygon shape, a battery array that a plurality of battery are provided in multi stages within the batterypack, a protecting circuit module provided between the upper portion of the battery array and the upper surface of the batterypack, and a connection terminal section provided in the lower stage of the battery pack and including a power terminal and a control terminal

A bottle cage may form a first support portion for supporting the battery pack and an external terminal providing a connector electrically connecting the each terminal of the connection terminal sections to the upper stage of the first support portion.

The bike frame may include the bottle cage fixed to at least one of a down tubes or a seat tubes.

In addition, the bottle cage may include a fixed wing for restricting lateral movement of the battery pack.

In addition, a first groove portion may be formed at the upper stage of the battery case. In this case, a fixed member formed in a shape similar to that of the first groove portion may be further included. The fixed member may be fixed to the bike frame and may be inserted into the first groove portion from the upper portion of the battery pack to form a first fixed protrusion fixing the battery pack.

Moreover, the fixed member may include a second support portion fixed to the frame, an extension extending from the second support portion to the upper side of the battery pack to enter a first fixed protrusion and an adjustment mechanism for regulating the amount of the fixed protrusion that extends within the first groove portion.

In addition, the adjustment mechanism may regulate an access to the fixed protrusion in the screw manners.

In addition, the adjustment mechanism may include a lock to be rotated through a separate key.

In addition, the external terminal portion may be formed to be upwardly protruded. In this case, a step may be formed to insert the external terminal portion. The second fixed protrusion may be formed on the upper surface of the first support

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portion. In this case, a second groove portion corresponding to the second fixed protrusion may be formed at the lower stage of the battery pack.

In addition, the connection terminal of the lower stage of the battery pack may be formed to be protruded. In this case, the first support portion forms a step to accommodate the connection terminal portion. Further, a third fixed protrusion may be positioned at the upper stage of the battery pack. In this case a third groove portion corresponding to third fixed protrusion may be formed in the first support portion.

Furthermore, a step into which the first support portion may be inserted at the lower end of the battery pack to predetermined depth may be formed.

In addition, the battery pack may be formed to have shape and size of the bottle for the bike and the bottle cage may selectively accommodates any one of either the battery pack or the bottle for the bike.

Moreover, the protecting cover may be formed as shape of the lower stage and interposed between the support portion of the bottle cage and the bottle for the bike may be further provided. In addition, each terminal portion of the connection terminal portion and each connector of the external terminal may be connected in a inserting manners. Furthermore, each terminal of the connection terminal portion may be formed in female connector shape and each connector of the external terminal portion may be formed in male shape.

According to an embodiment of the present disclosure, by providing the battery pack in a bottle shape, the electrical bike may accommodate the bottle for the bike and a battery pack.

In addition, according to an embodiment of the present disclosure, although the electric bike operates at the state accommodating the battery pack or the bottle for the bike, there an effect may be provided that protects the electrical connection terminal from external moisture and moisture of the bottle for the bike.

In addition, an embodiment of the present disclosure provides a stable structure in spite of an external impact at the time of operation of the bike.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, together with the specification, illustrate exemplary embodiments of the present disclosure, and, together with the description, serve to explain the principles of the disclosed embodiments.

FIG. 1 is a perspective view showing a frame structure of a conventional bike.

FIG. 2 is a bottom perspective view showing a battery pack according to an embodiment of the present disclosure.

FIG. 3 is a partial perspective view showing a battery pack

FIG. 4 is a disassemble perspective view showing an internal structure battery pack.

FIG. 5 is a cross-sectional view showing the appearance of battery pack.

FIG. 6 is a bottom perspective view showing an upper battery array of a battery pack.

FIG. 7 is a bottom-perspective view showing an appearance which a battery pack is provided with a spacer.

FIG. 8 is a bottom perspective view showing an internal structure of a battery pack.

FIG. 9 is a perspective view showing an appearance of a bottle cage corresponding to a battery pack.

FIG. 10 is a perspective showing a fixed number.

FIG. 11 is a partial perspective a appearance with which a battery pack is equipped.

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FIG. 12 is a partially showing bottom view showing an appearance of a battery pack according to another embodiment.

FIG. 13 is a perspective view showing an appearance of a bottle cage corresponding to a battery pack.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the following detailed description, only certain exemplary embodiments of the present disclosure have been shown and described, simply by way of illustration. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or scope of the present disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature and not restrictive. In addition, when an element is referred to as being “on” another element, it can be directly on the another element or be indirectly on the another element with one or more intervening elements interposed therebetween. Also, when an element is referred to as being “connected to” another element, it can be directly connected to the another element or be indirectly connected to the another element with one or more intervening elements interposed therebetween. Hereinafter, like reference numerals refer to like elements.

Generally, a bike or electrical bike **10** includes the bike frame, which is a basis framework, having a steering system such as a handle and the like, a driving system such as a crank and a sprocket, other wheel set and the like, as shown in the embodiment of FIG. 1.

The electrical bike may replace or assist a manpower driving the driving system of the bike.

Meanwhile, the bike frame **10** may include a top tube **11**, a down tube **12**, seat tube **13**, seat stay **15**, a chain stay **16** and a head tube **14**.

Generally, a fastening portion may be formed at the down tube **12** and the seat tube **13** and, thus, may equip the bottle cage capable of accommodating the bottle cage.

The present disclosure may relate, in certain embodiments, to a bike frame capable of selectively accommodating a battery pack capable of being positioned in a manner similar to that of a bottle.

The battery pack **100** will be described below with reference to FIG. 2 and FIG. 3.

FIG. 2 and FIG. 3 are perspective views showing a battery pack **100** according to an embodiment of the present disclosure and FIG. 3 is a bottom perspective view partially showing an embodiment of the battery pack **100**.

The battery pack **100**, in accordance with an embodiment of the present disclosure, may be formed as shape of bottle for the bike.

The battery pack **100** may be formed in cylindrical and/or polygon shapes as shown in FIG. 2. It may be understood that these shapes are provided for illustration and that embodiments of the battery pack **100** may be formed in other shapes that may be accommodated within a bike frame in a manner similar to a bottle (e.g., a water bottle).

In addition, the battery pack **100** may include a lid portion **111** formed as shape similar to the bottle for the bike at an upper portion thereof.

A first groove portion **118** may be formed at an upper portion of the lid **111**. A fixed protrusion **303** of a fixed member **300**, as described below with respect to FIG. 10, may be inserted to help fixing the battery pack **100**.

As shown in FIG. 3, a connection terminal portion **113** and a second terminal portion **114** may be formed on a lower

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surface **112** of the battery pack **100**. The connection terminal portion **113** may form a constant step to be formed as an internally depressed shape, as compared with the lower surface **112** of the battery pack **100**. The connection terminal portion **113** may also be provided with connection terminals, such as a power terminal **115** and a control terminal **116**, for electrically connecting with the outside. The power terminal **115** and the control terminal **116** may be formed as a pair of the terminal. The power terminal **115** may serve as a connecting port for transmitting power from the battery pack **100** to the bike driving system of the outside and the control terminal **116** may serve as the connecting port for transmitting a state of the battery to an indicating portion (not shown) of the outside or receiving an electrical control signal concerning control of the battery pack **100** from control section (not shown).

In other embodiments, the power terminal **115** and the control terminal **116** may be formed in an inserting manner and may be formed in a female connector shape or a male connector shape. The second groove portion **114** may be different from the connection terminal portion **113** and may be formed in internally depressed shape. In addition, the lower surface **112** of the battery pack **100** has a step having a constant height at a perimeter of an edge thereof to be internally formed.

Embodiments of an internal configuration for the battery pack **100** will be described below with reference to FIGS. **4**, **5**, **6**, **7**, and **8**. FIG. **4** is a disassembled, perspective view showing the internal construction of the battery pack **100** and FIG. **5** is a cross-sectional view showing the battery pack **100**. FIG. **6** is a bottom perspective view of an upper battery array of the battery pack **100**, FIG. **7** is a bottom perspective view showing the battery pack **100** having a second spacer, and FIG. **8** is a bottom perspective view showing the internal configuration of the battery pack **100**.

A battery array **120** and the protecting circuit module **110** may be accommodated within the battery pack **100**.

The protecting circuit module **110** may be provided between an upper portion of the battery array **120** and an upper portion of the battery pack **100**. The protecting circuit module **110** may include various elements and circuits in order to provide for a safety of each battery cell **121** of the battery array **120** at the time of charge and discharge of the battery pack **100** and may take charge of control of charge and discharge. If the protecting circuit module **110** is accommodated within a water bottle shape for the bike, the space necessary to accommodate various elements would be shortage. For this reason, the protecting circuit module **110** may be formed as a substrate including more than two stages.

In addition, an incision portion **117** (see, e.g., FIG. **5**) may be formed at an outer edge of the protecting circuit module **110**. In certain embodiments, a wiring electrically connecting each element and the like may be provided between a plurality of the substrates, the substrate of the upper and the lower protecting circuit module **110** may be separated and freely rotated should be prevented. At an inner peripheral surface of the battery pack **100**, a third fixed protrusion **102** corresponding to the above-mentioned incision portion **117** may be formed. When the protecting circuit module **110** may be accommodated within the battery pack **100**, the third fixed protrusion **102** may be inserted into the incision portion **117** of the protecting circuit module **110**, thereby restricting the free rotation of the protecting circuit module **110**.

At the battery array **120**, the plurality of battery cells **121** may be provided in a multi-stage. The each stage of the battery array **120** may be arranged in circle shape corresponding to a battery pack **100** of the outside.

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If the type assisting a manpower driving the driving system of the electrical bike using a power of the battery pack **100** may be used, a motor having an output characteristics of approximately 26V and 130 W would be utilized. In this case, preferably, the battery array **120** may be connected in seven series to obtain a sufficient capacity and may be connected in three parallel. That is, the total of twenty-one batteries may be connected in seven serials and three parallel manners.

In the embodiment, the battery array **120** may be arranged at two stages of the upper stage battery array **120a** and the lower stage-battery array **120b** as shown in FIG. **4**. In this case, the total of nine batteries may be arranged in the upper stage **120a** and the total of nine batteries or more (e.g., twelve batteries) may be arranged in the lower stage **120b**. The number of the battery cells of the upper stage **120a** and the lower stage **120b** may be variously changed, if necessary.

Each the battery cells **121** may be correctly inserted into a position to be positioned and preferably provides each first spacer **122a** at the upper stage and the upper stage thereof to be escaped randomly after the insertion. The first spacer **122a** formed in the upper stage and the lower stage may be assembled to be correctly positioned using back the second spacer **122b**. An inner peripheral surface of the second spacer **122b** may be formed similarly to shape of the outer peripheral surface of the first spacer **122a** and may be fixed in a small gap if the first spacer **122a** may be inserted. That is, the second spacer **122b** would be not randomly escaped if the first spacer **122a** may be inserted.

Now, an electrical connection within the battery pack relationship will be explained. The battery array **120** may include an output stage connected to the protecting circuit module **110**. The power transmitted to the protecting circuit module **110** may be electrically connected back to the power terminal **115** formed in the lower surface **112** of the battery pack **100**. In addition, the power may be electrically connected to the control terminal **116** formed in the lower surface **112** of the battery pack **100** from the protecting circuit module **110** through a separate connection line **124**. In this case, a minimum of two different types of the connection line **124** may be passed through the battery array **120**. That is, a line **124a** transmitting the power to the power terminal **115** from the protecting circuit module **110** to the control terminal **116** and a line **124b** for transmitting/receiving various control signals and state signals from the protecting circuit module **110** to the control terminal **116** may be provided (see, e.g., FIG. **7**). A line (not shown) for transmitting the power from the battery array **120** to the protecting circuit module **110** according to an arrangement method of the battery array **120** may be additionally provided.

Meanwhile, in the upper stage-battery array **120a**, a plurality of batteries (e.g., nine batteries cells **121**) may be disposed as circle shape as shown in FIG. **6**. A constant spacing portion **125** may be formed within the upper stage-battery array **120a** and the connection line **124** crossing the internal portion of the battery array **120** may be provided within the spacing portion **125**. Such a spacing portion **125** may be formed in any one of a plurality of stages including battery array **120** and simultaneously formed at the plurality of stages.

An embodiment of the bottle cage **200** will be described with reference to FIG. **9**. FIG. **9** is a perspective view of the bottle cage corresponding to the battery pack in FIG. **3**.

The bottle cage **200** may include a cage body **230** and a first support portion **220**.

A fastener **201** may be disposed within the cage body **230** formed to tighten the down tube **12** or seat tube **13**. The cage body **230** may be formed as a curved surface to correspond to

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the outer peripheral surface the battery pack **100** and the fixed wing **210** may be formed at both side surfaces of the cage body **230** to restrict a lateral movement of the battery pack **100**.

A first support portion **220** for supporting the lower surface **112** of the battery pack **100** may be formed from the lower stage of the bottle cage **200**. Between the bottle cage **200** and the first support portion **220**, the lower connection portion **231** having lower constant depth than the upper surface of the first support portion **220** may be formed.

At the upper stage of first support portion **220**, the external terminal **221** may be formed. The external terminal **221** forms a step which may be higher by constant height than the upper surface of the first support portion **220**. The external terminal **221** has the upper surface thereof including the power connector **222a** and the control connector **222b** connected to the above-mentioned power terminal **115** (see FIG. 3) and the control terminal **116** (see FIG. 3). When the power terminal **115** and the control terminal **116** are formed in female connector shape, respectively, the power connector **222a** and the control connector **222b** may be formed in male connector shape.

In addition, a second fixed protrusion **223** may be formed within the upper surface of the first support portion **220**. The second fixed protrusion **223** may be inserted into the second groove portion **114** of the lower surface **112** of the battery pack **100** to restrict the movement of the battery pack **100**.

An embodiment of the fixed member **300** will be described with reference to FIG. 10 and FIG. 11. FIG. 10 is a perspective view showing the fixed member **300** and FIG. 11 is a partial perspective view showing an appearance with which the battery pack **100** may be attached.

The fixed member **300** may include a second support portion **301**, an extension portion **302**, an adjustment mechanism **304**, and a first fixed protrusion **301**. The second support portion **301** may be fixed to the down tube **12** of the electrical bike and the like to help supporting the entire fixed member **300**. The extension portion **302** may extend from the second support portion **301**. The lower stage of the extension **302** may be provided with a first fixed protrusion **303** that enters an inner side of an outer side of the extension **302**. The fixed protrusion **303** may protrude into the outer side or enter the inner side of the extension depending on a rotation of the adjustment mechanism **304**. The adjustment mechanism **304** may be formed in a screw type and the like and preferably, may be formed in lock manners to require a certain qualification at the time of detachment of the battery pack **100**. That is, the first fixed protrusion **303** may protrude from the extension **302** or hide the extension portion **302** by rotating the adjustment mechanism **304** using a key corresponding to the adjustment mechanism **304**.

An embodiment of a mounting structure of a battery pack **100a** and a bottle cage **200a** according to another embodiment will be described with reference to FIG. 12 and FIG. 13. FIG. 12 is a partial bottom view showing an appearance of the battery pack **100a** according to another embodiment and FIG. 13 is a perspective view showing an appearance of an embodiment of the bottle cage **200a** corresponding to the battery pack **100a** shown in FIG. 12.

The battery pack **100a** according to an embodiment of the disclosure may be different from the battery pack **100** in FIG. 3 in that a connecting terminal portion **113a** of the lower surface **112a** may externally protrude. In addition, the third fixed protrusion **114a** may be formed to protrude from outside thereof instead of the second groove portion **114**.

Meanwhile, the first support portion **220a** may form a step in which an external terminal portion **221a** is depressed, as

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compared to the first support portion **220**, to correspond to the battery pack **100a** shown in the embodiment of FIG. 12. In addition, a third groove portion **223a** corresponding to the fixed protrusion **114a** may be formed.

In this case, the connection terminal portion **113a** of the battery pack **100a** may be inserted into the external terminal portion **221a** and may be seated therein and the third fixed protrusion **114a** may be inserted into the third groove portion **223a** and may be seated therein.

The bottle cage **200a** in accordance with an embodiment of the present disclosure may not include the protrusion having direct contact with the bottom of the bottle for the bike, so that it is more beneficial to accommodate the bottle for the bike.

The bottle cage **200** of the embodiment of FIG. 2 may provide the first support portion **220** with a protecting cover (not shown) formed in shape of the lower stage portion of the battery pack **100** (see FIG. 3), thereby accommodating the bottle for the bike. In this case, at least a portion of the protecting cover may be formed from a waterproof material.

The terms “approximately”, “about”, and “substantially” as used herein represent an amount close to the stated amount that still performs a desired function or achieves a desired result. For example, the terms “approximately”, “about”, and “substantially” may refer to an amount that is within less than 10% of, within less than 5% of, within less than 1% of, within less than 0.1% of, and within less than 0.01% of the stated amount.

It should be emphasized that many variations and modifications may be made to the above-described embodiments, the elements of which are to be understood as being among other acceptable examples. All such modifications and variations are intended to be included herein within the scope of this disclosure and protected by the following claims.

What is claimed is:

1. A battery pack, comprising:

- a battery array providing a plurality of batteries to an inner portion of the battery pack as at least 2 stages or more and positioned the battery as an annular shape, wherein the at least two forms a space at inner portion thereof wherein the space extends from an upper surface of the at least 2 stages of batteries to a lower surface of the at least 2 stages of batteries
- a protecting circuit module provided between the upper portion of the battery array and the upper surface of the battery pack;
- a connection terminal portion disposed on the lower stage of the battery pack; and
- a control terminal positioned adjacent the lower surface of the at least 2 stages of batteries and a power terminal connected to the protecting circuit module through the space of the battery array arranged in an annular shape.

2. The battery pack of claim 1, wherein an incision portion is formed at an outer side of the protecting circuit module and a third fixed protrusion corresponding to the incision portion is formed in an inner side of the battery pack, wherein the third fixed protrusion is configured to restrict the movement of the protecting circuit module when inserted in the incision portion.

3. The battery pack of claim 1, wherein the battery array is formed as a upper and lower stages, wherein any one of the upper and lower two stages of the battery array includes nine batteries arranged at the outer side thereof in an annular shape and a remaining one stage includes nine batteries arranged as annular shape at outer side thereof

4. The battery pack of claim 3, wherein the battery array includes a connection tab connecting in seven series and three

parallel manners between the upper stage and the lower stage of the upper and lower two stages of the battery array.

5. The battery pack of claim 1, further comprising a spacer forming an inserting position of each battery having the battery array.

6. The battery pack of claim 1, wherein, the control terminal and the power terminal are formed in a female connector shape.

7. The battery pack of claim 1, wherein the protecting circuit module is formed as at least two or more multi-stage substrates.

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